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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a new amino compound, its manufacturing method, and its use. The amino compound of this invention can be used for a luminescent material, an organic photoconducting material, etc., and, more specifically, is useful to the organic electroluminescence element and electro photography photo conductor which are used for the surface light source or a display.

[0002]

[Description of the Prior Art]An organic photoconductivity material currently developed as a photo conductor or a charge transporting material has low cost and various processability, there are many advantages, such as nonpolluting, and many compounds are proposed.

[0003]For example, organic photoconducting materials, such as an oxadiazole compound, a hydrazone compound, a pyrazoline compound, an oxazol compound, an arylamine compound, a benzidine compound, a stilbene compound, and a butadiene compound, are proposed.

[0004]An electro photography photo conductor is mentioned as one of the art using a charge transporting material. An electrophotographing system is one of the image formation methods invented by Carlsson. This method consists of transferring on paper the toner image acquired by carrying out image exposure, making an electrostatic latent image form on a photo conductor, making a toner adhere on this electrostatic latent image, and developing negatives, after being charged in a photo conductor by corona discharge.

[0005]That suitable potential is held in a dark place as the fundamental characteristic required of the photo conductor in such an electrophotographing system, that there is little loss of the electric charge in a dark place, dissipating an electric charge promptly by optical exposure, etc. are mentioned. As for the conventional electro photography photo conductor, inorganic photo conductors, such as selenium, a selenium alloy, a zinc oxide, and a cadmium sulfide, have

been used. Although it has an advantage, like these inorganic matter photo conductor has high endurance, and there are many ** -proof sheets, problems, such as that a manufacturing cost is inferior to high processability and having toxicity, are pointed out.

[0006] In order to conquer these faults, development of an organic photo conductor is performed, but the actual condition is that that with which it is not necessarily satisfied of electrophotographic properties, such as electrostatic property, sensitivity, and rest potential, cannot mean the electro photography photo conductor which used the organic photo conductor to the former for the charge transporting material.

It has the charge transport capability to have excelled and development of a durable charge transporting material was desired.

[0007] An organic electroluminescence element is mentioned as art using a charge transporting material. Promising ** of the use as a cheap solid luminescence type big screen full color display device is carried out, and, as for the electroluminescent element which uses an organic compound, much researches are done.

[0008] Generally the organic electroluminescence element comprises a counterelectrode of the couple which sandwiched the luminous layer and this luminous layer. When an electric field is impressed between two electrodes, an electron is poured in from the negative pole and, as for luminescence, an electron hole is poured in from the anode. When this electron and electron hole recombine in a luminous layer and an energy level returns from a conducting zone to a valence band, it is a phenomenon which releases energy as a light.

[0009] The conventional organic electroluminescence element had high driver voltage compared with the inorganic electroluminescent element, and light emitting luminance and its luminous efficiency were also low. Characteristic degradation is also remarkable and it did not result in utilization. In recent years, the organic electroluminescence element which laminated the thin film containing an organic compound with the high fluorescence amount child efficiency which emits light by the low voltage not more than 10V is reported, and the interest is attracted (refer to it applied physics Letters, 51 volumes, 913 pages, and 1987).

[0010] The metal chelate complex was used for the illuminant layer, it used the amine compound for the hole injection layer, and this method has obtained high-intensity green emission.

With the direct current voltage of 6-7V, luminosity attains several 100 cd/m², the maximum luminous efficiency attains 1.5 lm/W, and it has the performance near a practical use field.

[0011] However, the organic electroluminescence element by the present does not have still sufficient light emitting luminance, although luminous efficiency is improved by the improvement of composition. It has the big problem of being inferior to the stability in the time

of repeated use. Therefore, it has bigger light emitting luminance, and has the charge transport ability outstanding for development of the organic electroluminescence element excellent in the stability in the time of repeated use, and development of a durable charge transporting material is desired.

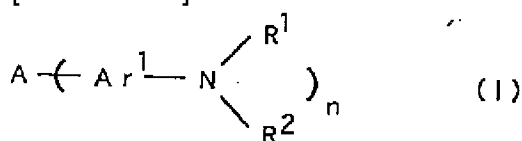
[0012]

[Problem(s) to be Solved by the Invention] This invention was made in view of the above situations, and there is a place made into the purpose in providing a new amino compound and its manufacturing method useful as durable charge transporting material and luminescent material, and its use.

[0013]

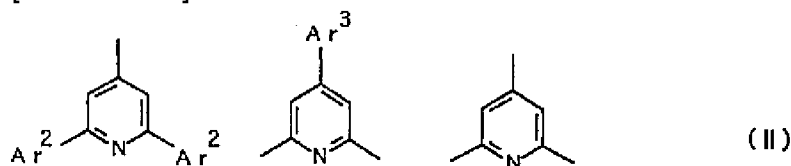
[Means for Solving the Problem] That is, this invention provides a new amino compound expressed with following general formula (I).

[Formula 22]



A expresses the basis expressed with following general formula (II) among the above-mentioned formula.;

[Formula 23]



Among general formula (II), Ar^2 and Ar^3 express aryl groups, such as a phenyl group, a biphenyl group, a terphenyl group, and a naphthyl group, and are a phenyl group, a biphenyl group, etc. preferably. Those bases Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, It may have heterocycle groups, such as aryl groups, such as aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent.

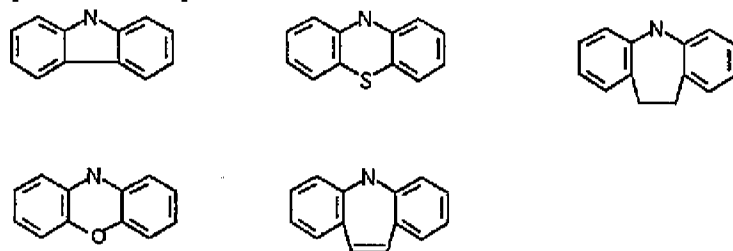
[0014] Among general formula (I), Ar^1 expresses allylene groups, such as a phenylene group, a biphenylene group, a terphenylene group, and a naphthylene group, and is a phenylene group, a biphenylene group, etc. preferably. Those bases Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, It may have heterocycle groups, such as aryl groups, such as aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, a phenyl group, a biphenyl group, and a

naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent.

[0015]n expresses an integer of 1, 2, or 3 among general formula (I). Namely, a connecting position of Ar¹ which is an allylene group combined with a pyridine ring, It is the 4th place of a pyridine ring, the 2 or 6th place or 2, and the 4 or 6th place, and when two or more Ar¹ combines with A, even if a portion to Ar¹, R¹, and R² is the same and they differ, it is not cared about.

[0016]R¹ and R² among general formula (I), respectively independently, Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, A phenyl group which is not replaced [aralkyl groups, such as benzyl, substitution, or], a biphenyl group, a nitrogen atom which aromatic heterocycle groups, such as a thienyl group which is not replaced [aryl groups, such as a naphthyl group substitution, or], a furil group, and a pyridyl group, are expressed, R¹ and R² are united, and R¹ and R² combine -- a ring, for example,;

[Formula 24]



It may form. Ring which the phenyl group and R¹ which may have a substituent, and R² were [ring] united and formed more preferably;

[Formula 25]

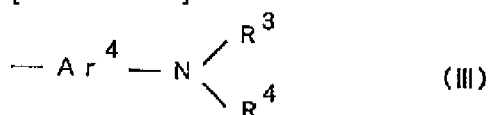


It comes out.

[0017]These rings may have alkoxy groups, such as alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, a methoxy group, an ethoxy basis, and a propoxy group, as a substituent.

[0018]Reither one of R¹ or ², and both are following general formula (III)s.;

[Formula 26]

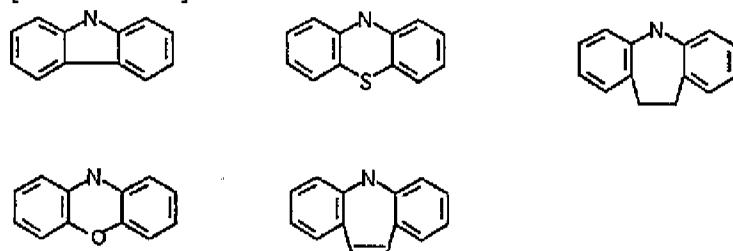


In the case of an aryl group which comes out and has a substituent expressed, Ar⁴ expresses

allylene groups, such as a phenylene group, a biphenylene group, a terphenylene group, and a naphthylene group, and is a phenylene group, a biphenylene group, etc. preferably.

[0019] Those bases Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, It may have heterocycle groups, such as aryl groups, such as aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent. Independently R^3 and R^4 , respectively A methyl group, an ethyl group, Aralkyl groups, such as alkyl groups, such as n-propyl group and an isopropyl group, and benzyl, Aryl groups, such as a phenyl group which is not replaced [substitution or], a biphenyl group, and a naphthyl group, a nitrogen atom which aromatic heterocycle groups, such as a thienyl group which is not replaced [substitution or], a furil group, and a pyridyl group, are expressed, R^3 and R^4 are united, and R^3 and R^4 combine -- a ring, for example,;

[Formula 27]



It may form. Ring which the phenyl group and R^3 which may have a substituent, and R^4 were [ring] united and formed more preferably;

[Formula 28]

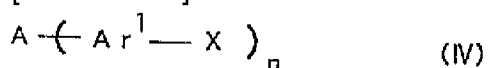


It comes out.

[0020] These rings may have alkoxy groups, such as alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, a methoxy group, an ethoxy basis, and a propoxy group, as a substituent.

[0021] The amino compound expressed with general formula (I) can be manufactured using a publicly known chemical reaction using a specific source material. For example, halogenated compound expressed with following general formula (IV);

[Formula 29]



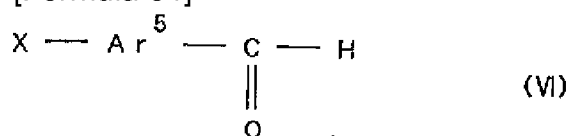
(-- the inside of a formula, A and Ar^1 , and n -- general formula (I) -- inside, the meaning, and X express a halogen atom.) -- amino compound; expressed with following general formula (V)
[Formula 30]



(-- the inside of a formula, R^1 , and R^2 -- general formula (I) -- it can manufacture by making the meaning) react inside.

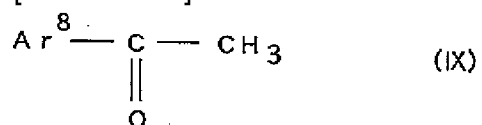
[0022]Formylation aryl compound expressed with following general formula (VI) as an example of manufacture of a halogenated compound expressed with said general formula (IV);

[Formula 31]



the inside of a formula, and Ar^5 -- a phenylene group, a biphenylene group, and a terphenylene group. ; which allylene groups, such as a naphthylene group, are expressed and is a phenylene group, a biphenylene group, etc. preferably -- a basis of them, Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, Aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, ;X which may have heterocycle groups, such as aryl groups, such as a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent expresses a halogen atom. Acetylation aryl compound expressed with following general formula (IX);

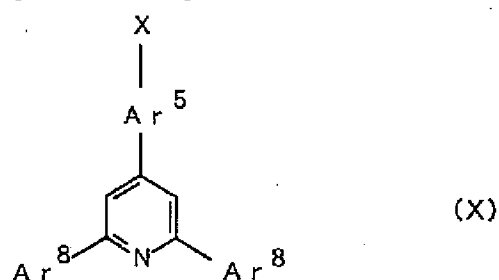
[Formula 32]



[0023]; which Ar^8 expresses aryl groups, such as a phenyl group, a biphenyl group, a terphenyl group, and a naphthyl group, among a formula, and is a phenyl group, a biphenyl group, etc. preferably -- the basis of them, Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, Aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, Aryl groups, such as a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, it may have heterocycle groups, such as a furil group and a pyridyl group, as a substituent. the halogenation 2 and 4

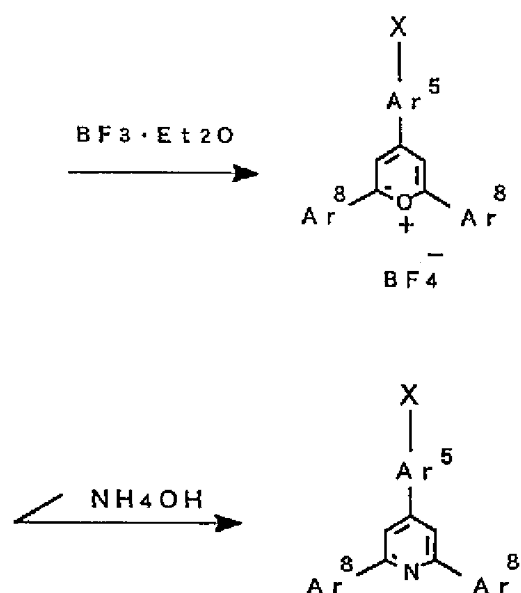
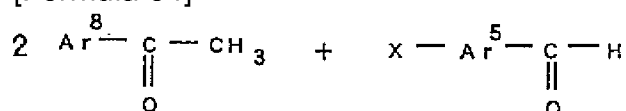
expressed with following general formula (X) by heat-treating among ammonia or the solution of ammonium salt after making it react and obtaining pyrylium salt, and 6 doria -- reel pyridine compound;

[Formula 33]



(Ar⁵ and Ar⁸ are the above and the meaning among a formula, and X expresses a halogen atom.) -- the case where it is made to convert -- following scheme;

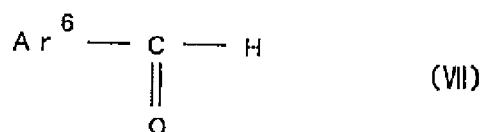
[Formula 34]



It is come out and shown.

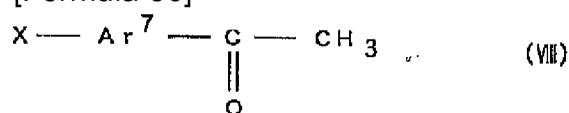
[0024]Formylation aryl compound expressed with following general formula (VII) in a similar way;

[Formula 35]



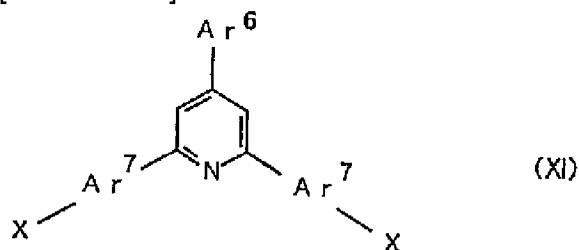
; which Ar^6 expresses aryl groups, such as a phenyl group, a biphenyl group, a terphenyl group, and a naphthyl group, among a formula, and is a phenyl group, a biphenyl group, etc. preferably -- the basis of them, Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, Aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, It may have heterocycle groups, such as aryl groups, such as a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent. Acetylation aryl compound expressed with following general formula (VIII);

[Formula 36]



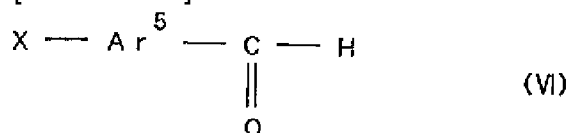
[0025]the inside of a formula, and Ar^7 -- a phenylene group, a biphenylene group, and a terphenylene group. ; which allylene groups, such as a naphthylene group, are expressed and is a phenylene group, a biphenylene group, etc. preferably -- the basis of them, Alkyl groups, such as a methyl group, an ethyl group, n-propyl group, and an isopropyl group, Aralkyl groups, such as alkoxy groups, such as a methoxy group, an ethoxy basis, and a propoxy group, and benzyl, ;X which may have heterocycle groups, such as aryl groups, such as a phenyl group, a biphenyl group, and a naphthyl group, a thienyl group, a furil group, and a pyridyl group, as a substituent expresses a halogen atom. the halogenation 2 and 4 which makes react and is expressed with account general formula (XI), and 6 doria -- reel pyridine compound;

[Formula 37]



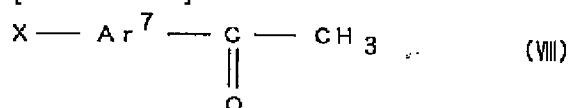
[0026](Ar^6 and Ar^7 are the above and the meaning among a formula, and X expresses a halogen atom.) -- formylation aryl compound; expressed with OK or following general formula (VI)

[Formula 38]



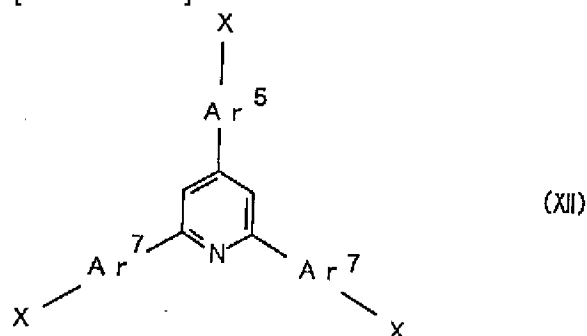
(-- the inside of a formula, Ar^5 , and X -- the above and the meaning.) -- acetylation aryl compound; expressed with following general formula (VIII)

[Formula 39]



(-- the inside of a formula, Ar^7 , and X -- the above and the meaning.) -- the halogenation 2 and 4 which makes react and is expressed with following general formula (XII), and 6 doria -- reel pyridine compound;

[Formula 40]



(among a formula, Ar^5 and Ar^7 are the above and the meaning, and even if, and they differ, they are not cared about --;X expresses a halogen atom.) -- it can also obtain.

[0027]Amino compound expressed with these halogenated compounds and following general formula (V)s;

[Formula 41]



(-- the inside of a formula, R^1 , and R^2 -- the above and the meaning.) -- the amino compound expressed with general formula (I) can be manufactured by making it react. A Ullmann reaction can perform composition of the above-mentioned amino compound under existence with a basic compound or a transition metal compound catalyst, and a solvent.

[0028]As a basic compound used for composition of the above-mentioned amino compound,

although hydroxide of an alkaline metal, carbonate, a hydrogencarbonate, an alcoholate, etc. are common, it is also possible to use an organic base like the 4th class ammonium compound, fatty amine, or aromatic amine. In this, it is used as what has desirable carbonate and a hydrogencarbonate of an alkaline metal or the 4th class ammonium. Carbonate, a hydrogencarbonate, and an alcoholate of a viewpoint of reaction velocity and thermal stability to an alkaline metal are the most preferred.

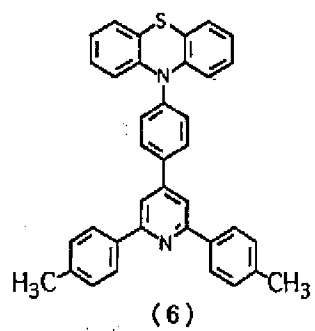
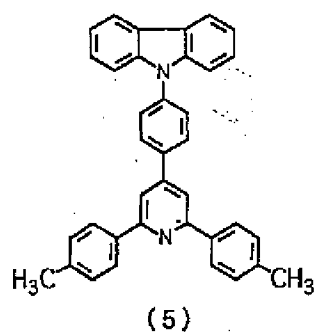
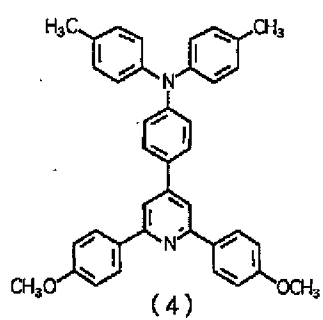
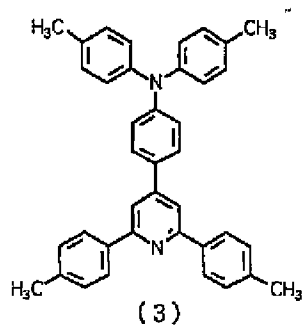
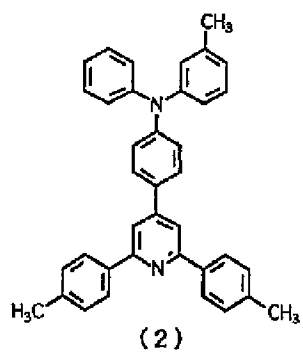
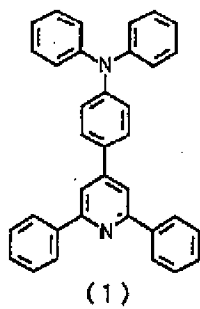
[0029]Although metal, such as Cu, Fe, nickel, Cr, V, Pd, Pt, and Ag, and those compounds are used, for example as a transition metal used for composition, or a transition metal compound catalyst, copper from a point of yield, palladium, or those compounds are preferred. Although there is no limitation in particular as a copper compound and almost all copper compounds are used, A cuprous iodide, a cuprous chloride, copper I oxide, the first copper of bromination, a cuprous cyanide, the first copper of sulfuric acid, cupric sulfate, a cupric chloride, the second copper of hydroxylation, a cupric oxide, the second copper of bromination, the second copper of phosphoric acid, the first copper of nitric acid, the second copper of nitric acid, copper carbonate, the first copper of acetic acid, cupric acetate, etc. are preferred. Also in it, a cuprous iodide, a cuprous chloride, copper I oxide, the first copper of bromination, the first copper of sulfuric acid, cupric sulfate, a cupric chloride, a cupric oxide, the second copper of bromination, the first copper of acetic acid, and cupric acetate are easily preferred at an available point. Also as a palladium compound, a halogenide, sulfate, a nitrate, organic acid salt, etc. can be used. The amount of a transition metal and its compound used is 0.5-500-mol% of halogenated compounds made to react.

[0030]Although to generally use a solvent used by composition and what is necessary is just a solvent, aprotic polar solvents, such as dichlorobenzene, nitrobenzene, dimethylformamide, dimethyl sulfoxide, and N-methyl pyrrolidone, are used preferably. Although a reaction is performed in a temperature requirement (100 ** - 250 **) under ordinary pressure, even if it carries out under application of pressure, generally, it does not interfere. After removing solid content after ending reaction and in reaction mixture, decompression distilling off of the solvent can be carried out, and an object can be obtained.

[0031]The following are mentioned as an example of the above-mentioned amino compound. A thing which has presented an amino compound of this invention restrictively is not indicating these illustration by intention limited to these, either.

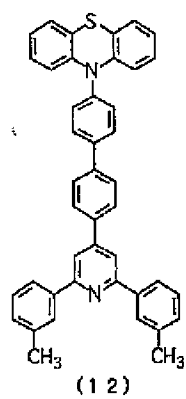
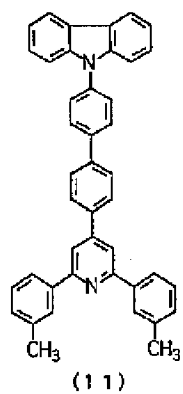
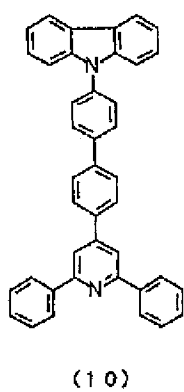
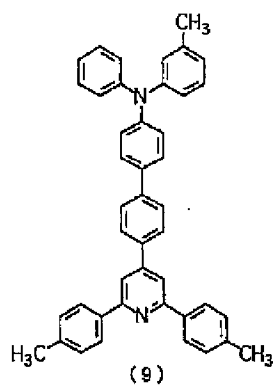
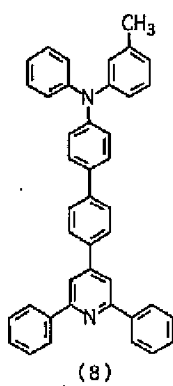
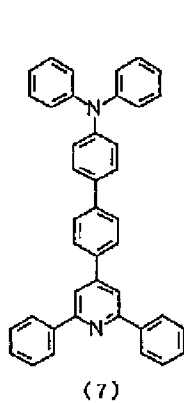
[0032]

[Formula 42]



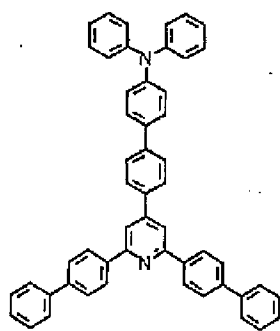
[0033]

[Formula 43]

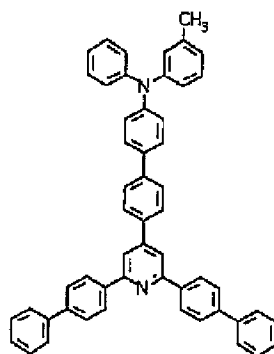


[0034]

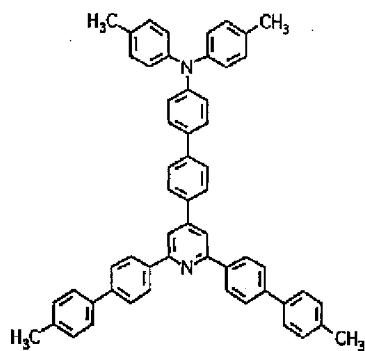
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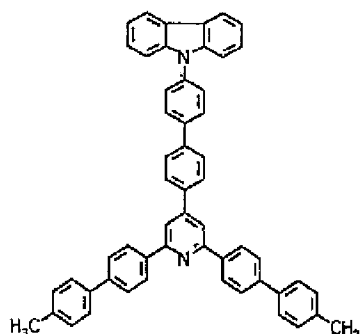
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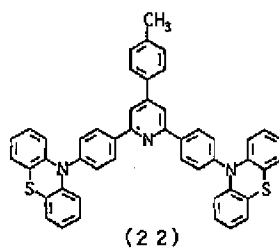
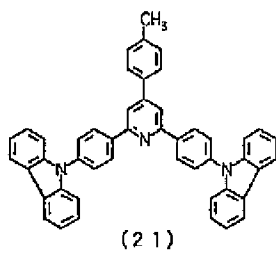
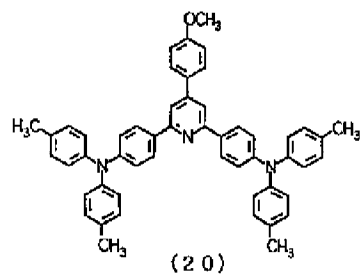
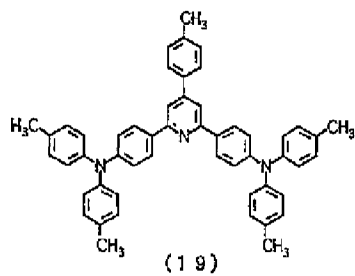
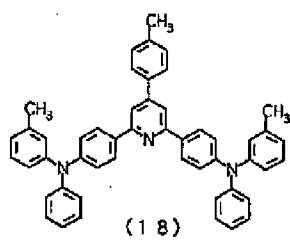
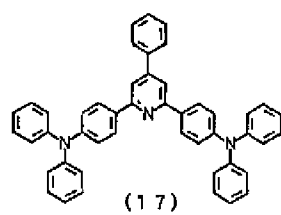
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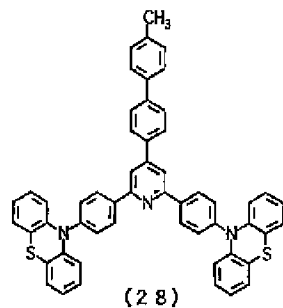
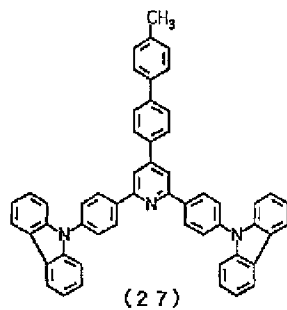
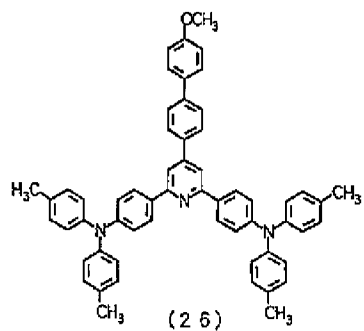
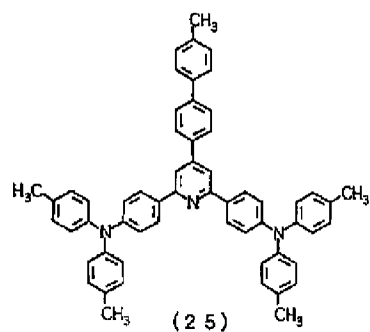
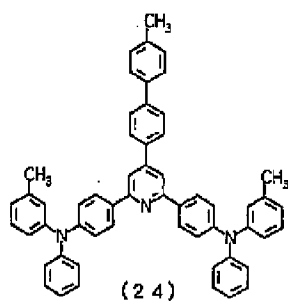
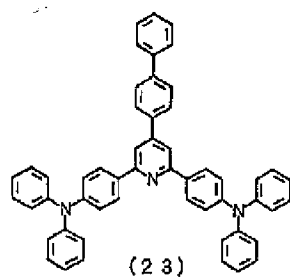
[0035]

[Formula 45]



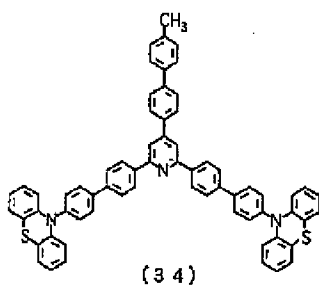
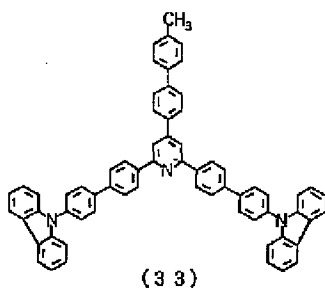
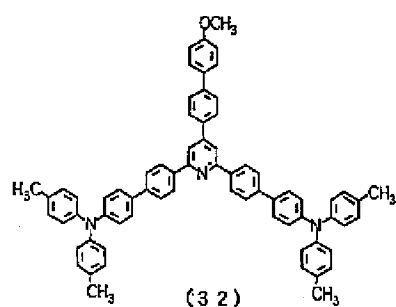
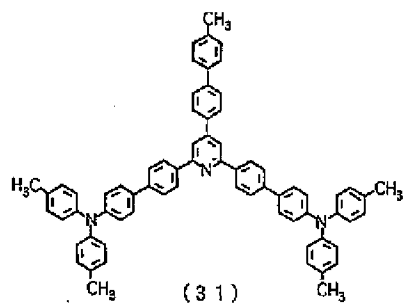
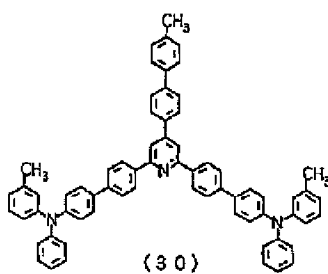
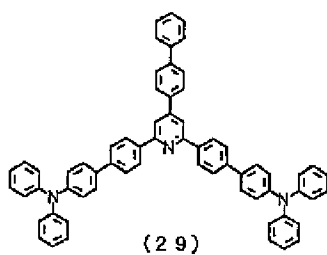
[0036]

[Formula 46]



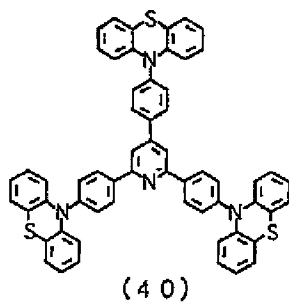
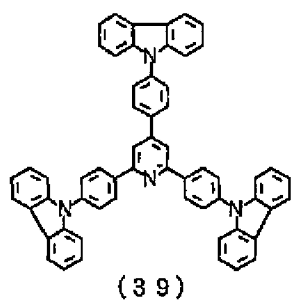
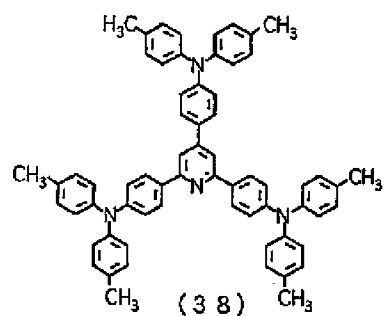
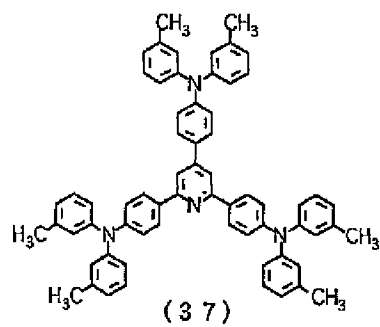
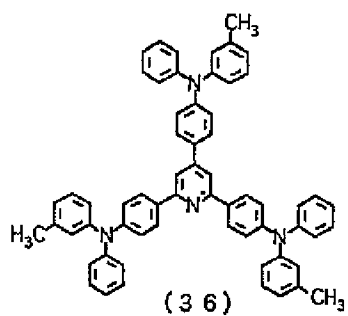
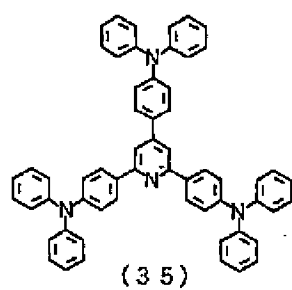
[0037]

[Formula 47]



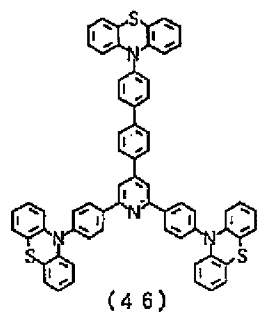
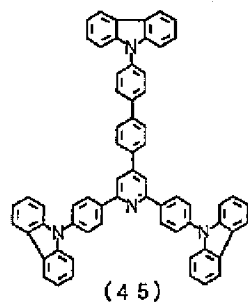
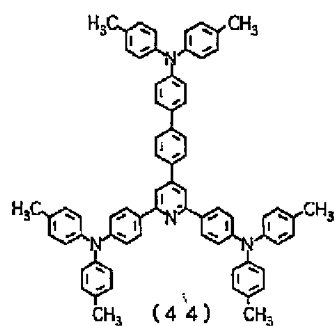
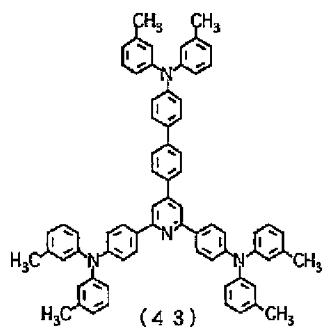
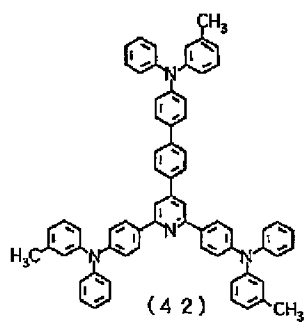
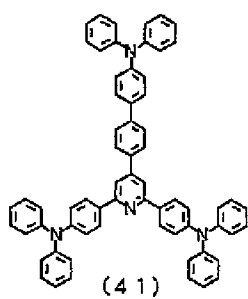
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[Formula 48]



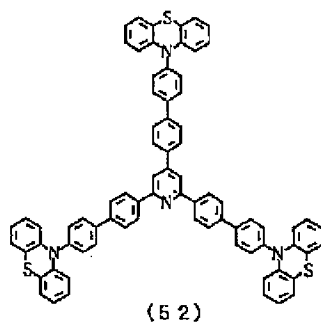
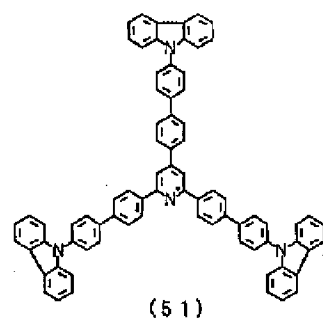
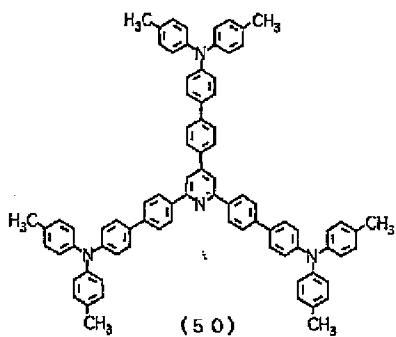
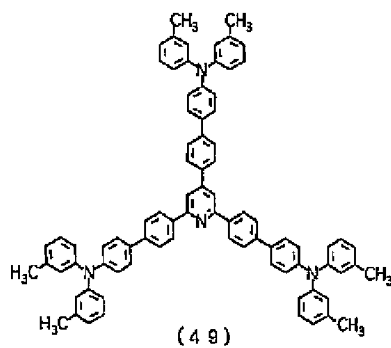
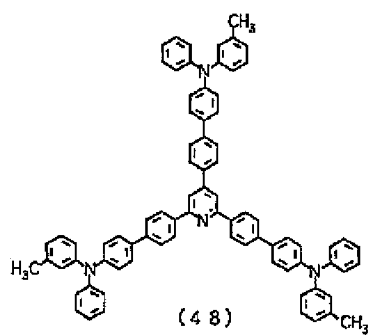
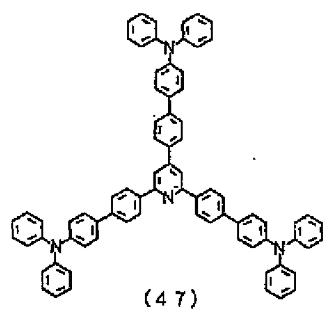
[0039]

[Formula 49]



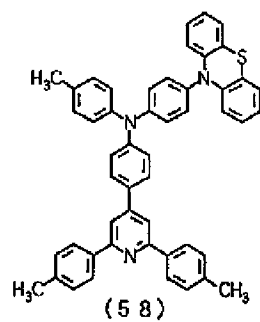
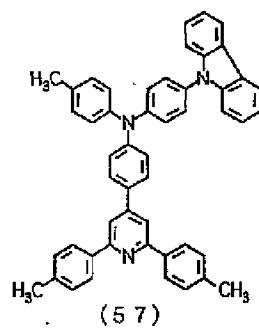
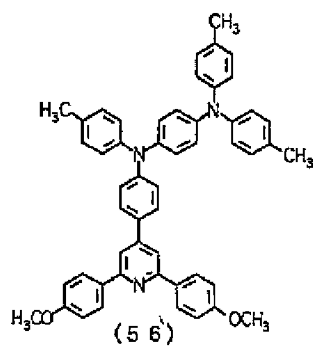
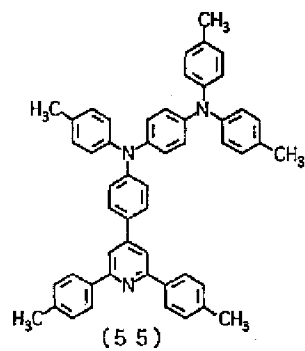
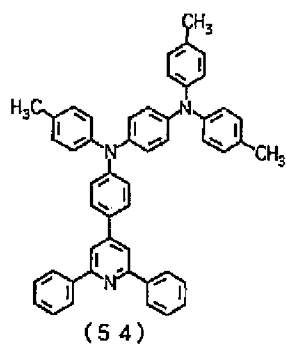
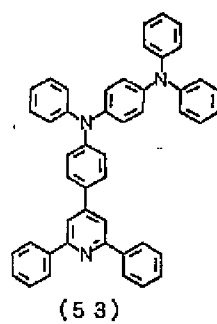
[0040]

[Formula 50]



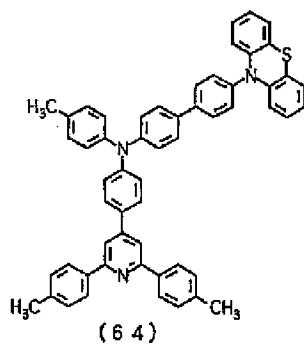
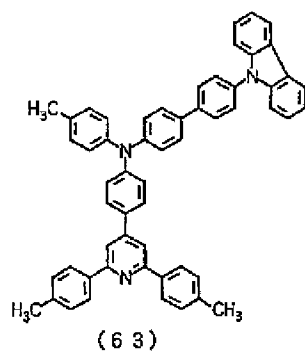
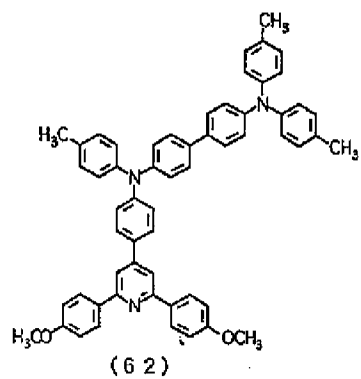
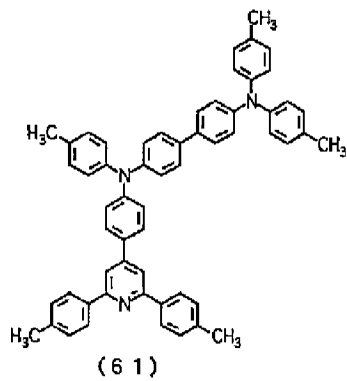
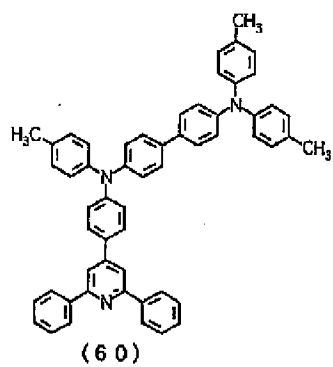
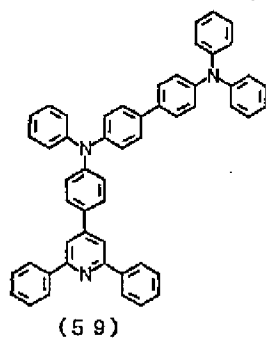
[0041]

[Formula 51]



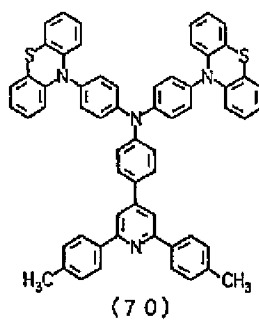
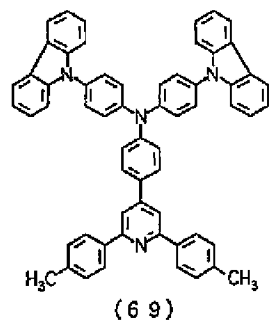
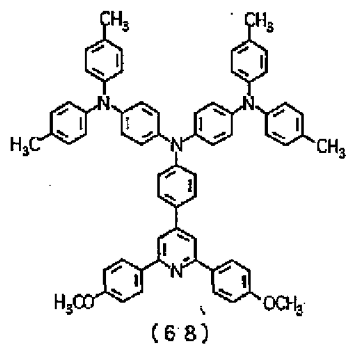
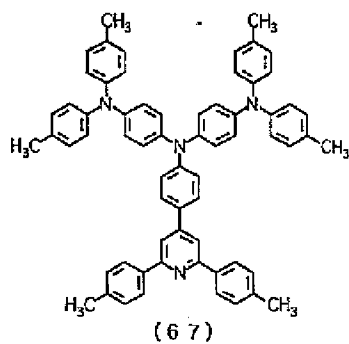
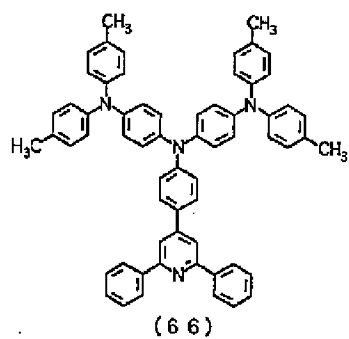
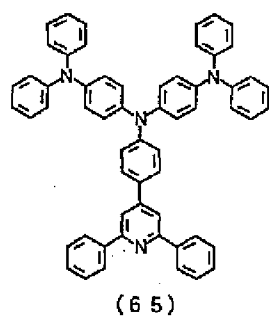
[0042]

[Formula 52]



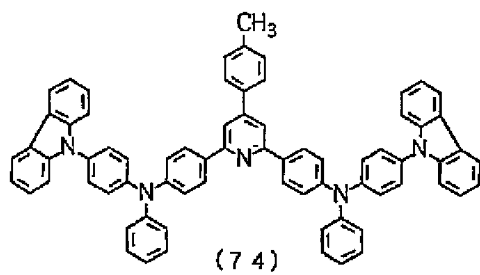
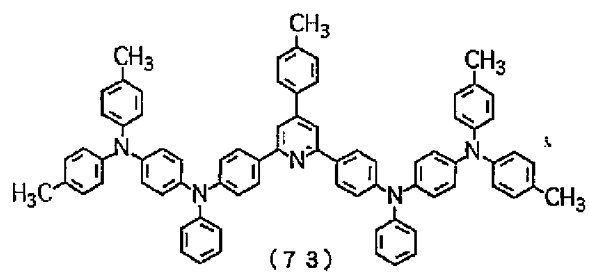
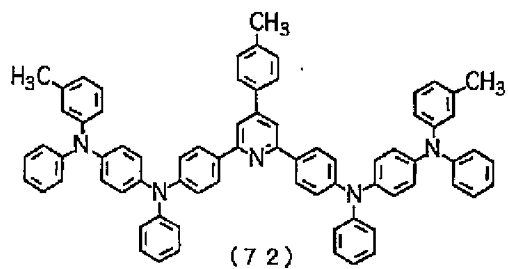
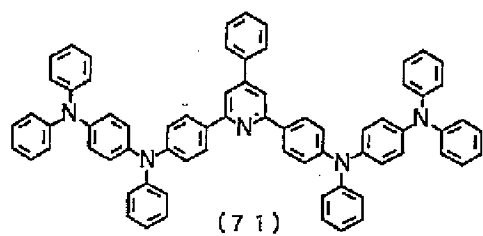
[0043]

[Formula 53]



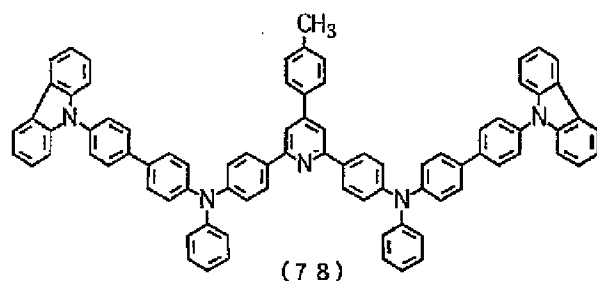
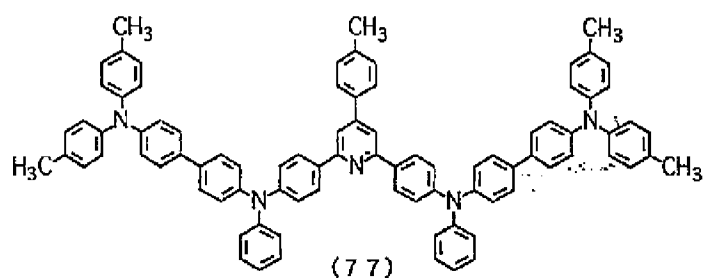
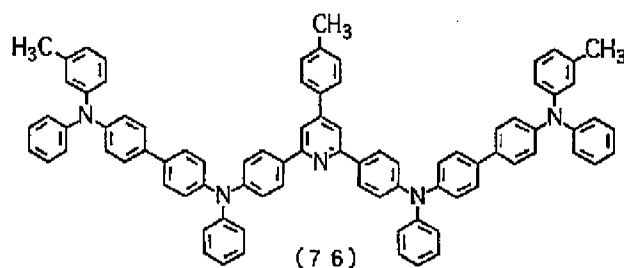
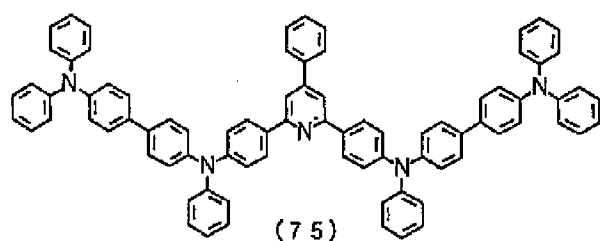
[0044]

[Formula 54]



[0045]

[Formula 55]



[0046]The amino compound expressed with general formula (I) is excellent in the charge transport function, especially the electron hole transportation function, and excellent in endurance and heat resistance. Therefore, the amino compound expressed with general formula (I) of this invention is excellent in the use as a charge transporting material, and can consider various application using such a function, for example, can use it conveniently as a photo conductor or a charge transporting material of an organic electroluminescence element.

[0047]First, a case where an amino compound shown by general formula (I) is used as an electro photography photo conductor is explained. Although it can be used also in which layer of an electro photography photo conductor, since an amino compound shown by general formula (I) has the high charge transport characteristic, it is desirable to use it as a charge

transporting material.

[0048]Since an electric charge which the above-mentioned amino compound acted as charge transport material, and was generated by optical absorption, or was poured in from an electrode can be conveyed very efficiently, it is possible to obtain a photo conductor excellent in sensitivity and high speed response nature. Since this compound is excellent in ozone resistance and light stability, it can obtain a photo conductor excellent in endurance.

[0049]A photo conductor which forms a photosensitive layer of a monolayer type which distributes a charge generating material and a charge transporting material to suitable binder resin on a conductive substrate as an electro photography photo conductor, for example, A photo conductor which laminates an undercoat layer, a photosensitive layer, and a surface protection layer one by one is mentioned on a photo conductor which laminates a charge generating layer and a charge transport layer as a photosensitive layer on a base material, a photo conductor which forms an undercoat layer and a conductive layer on a base material, and forms a photosensitive layer on it, or a base material.

[0050]As a base material, what was made into foil, such as copper, aluminum, iron, nickel, and stainless steel, or a board, or drum shape is used. It is usable also in what provided a layer of conductive compounds, such as vacuum deposition, a thing which carried out electroless deposition or a conductive polymer, indium oxide, and tin oxide, for these metal by spreading or vacuum evaporation on paper or a plastic drum at paper, a plastic drum, etc. An aluminum pipe which aluminum was generally used, for example, performed drawing processing after extruding is cut, About 0.2-0.3 mm was cut and made to the outside surface using cutting tools, such as a diamond turning tool (cutting pipe), What finished an outside surface by ironing after carrying out deep drawing of the aluminum disk and considering it as cup shape (DI pipe), After carrying out impact processing of the aluminum disk and considering it as cup shape, what finished an outside surface by ironing (EI pipe), a thing (ED pipe) which carried out cold drawing processing after extruding, etc. are mentioned. What cut these surfaces further may be used.

[0051]When forming an undercoat layer on a base material, using an oxide film produced by making anodize a support surface as an undercoat layer is often performed. When a base material is an aluminum containing alloy, it is effective to use an alumite layer as an undercoat layer. It is formed also a solution in which suitable resin was dissolved, and by distributing a low resistance compound in it, applying these solution and dispersion liquid on the above-mentioned conductive substrate, and drying them. In this case, polyimide, polyamide, a nitrocellulose, a polyvinyl butyral, polyvinyl alcohol, etc. may be suitable, and may make these resin distribute a low resistance compound as a material used for an undercoat layer. As a low resistance compound, organic compounds, such as metallic compounds, such as tin oxide, titanium oxide, a zinc oxide, zirconium oxide, and magnesium fluoride, an organic color and an

electronic suction nature organic compound, and an organometallic complex, are used suitably. As for thickness of an undercoat layer, about 0.2-3 micrometers is preferably desirable 0.1-5 micrometers.

[0052]Although a photosensitive layer is formed on the above-mentioned base material or an undercoat layer, a case where a charge generating layer and a charge transport layer are laminated as a photosensitive layer is explained hereafter. If in forming a charge generating layer you carry out vacuum deposition of the charge generating material, or you make it dissolve in a suitable solvent, and it applies or there is a suitable solvent or necessity about paints, spreading desiccation will be carried out and coating liquid which distributed in a solution in which binding resin was dissolved, and was produced will be formed. What was seen from an adhesive point and distributed in resin is good. As for thickness of a charge generating layer, about 0.05-1 micrometer is preferably desirable 0.01-2 micrometers. Although 100 or less % of the weight is preferred to a charge generating material as for binder resin used in order to form a charge generating layer, it is not this limitation. Two or more kinds of resin may be used combining it.

[0053]as the charge generating material used for a charge generating layer -- azo pigment (screw azo pigment.) tris azo pigment is included -- doria -- a reel methane series color and a thiazine series color. An oxazine system color, xanthene dye, cyanine dye, styryl system coloring matter, Organic system paints, such as a pyrylium system color, quinacridone series paints, indigo system paints, perylene system paints, polycyclic quinone system paints, screw benzimidazole system paints, inda SURON system paints, SUKUARIUMU system paints, and phthalocyanine pigment, a color, etc. are mentioned. If it is the material which absorbs light and generates a charge carrier in very high probability also except this, even if it is which material, it can be used, but especially azo (screw system, tris system) paints and a phthalocyanine pigment are preferred.

[0054]As resin used with this charge generating material, For example, saturated polyester resin, polyamide resin, an acrylic resin, an ethylene-vinylacetate copolymer, An ion bridge construction olefine copolymer (ionomer), a styrene butadiene block copolymer, Polyarylate, polycarbonate, a polyvinyl chloride acetate copolymer, Cellulose ester, polyimide, styrol resin, polyacetal resin, Thermoplastic binders, such as phenoxy resin, an epoxy resin, urethane resin, Photo electroconductive polymer, such as heat-curing binders, such as silicone resin, phenol resin, melamine resin, xylene resin, an alkyd resin, and thermosetting acrylics, a photo-setting resin, poly-N-vinylcarbazole, polyvinyl pyrene, and polyvinyl anthracene, can be used.

[0055]With these resin, the above-mentioned charge generating material Methanol, ethanol, Alcohols, such as isopropanol, acetone, methyl ethyl ketone, Amide, such as ketone, such as cyclohexanone, and N,N-dimethylacetamide. Sulfoxides, such as dimethyl sulfoxide, a tetrahydrofuran, dioxane, Ether, such as ethylene glycol monomethyl ether, methyl acetate,

Ester species, such as ethyl acetate, chloroform, a methylene chloride, a dichloroethane, Aliphatic series halogenated hydrocarbon, such as a carbon tetrachloride and trichloroethylene. Or sensitization coating liquid which distributed or dissolved in organic solvents, such as aromatic series, such as benzene, toluene, xylene, ligroin, monochlorobenzene, and dichlorobenzene, and was prepared is applied on the above-mentioned conductive substrate, it is made to dry and a charge generating layer is provided. A charge transport layer containing a charge transporting material and binder resin is provided on a charge generating layer formed as mentioned above.

[0056]As binder resin, for example Polycarbonate, polyarylate, Saturated polyester resin, polyamide resin, an acrylic resin, an ethylene-vinylacetate copolymer, An ion bridge construction olefine copolymer (ionomer), a styrene butadiene block copolymer, Polyarylate, polycarbonate, a polyvinyl chloride acetate copolymer, Cellulose ester, polyimide, styrol resin, polyacetal resin, Thermoplastic binders, such as phenoxy resin, an epoxy resin, urethane resin, Photo electroconductive polymer, such as heat-curing binders, such as silicone resin, phenol resin, melamine resin, xylene resin, an alkyd resin, and thermosetting acrylics, a photo-setting resin, poly-N-vinylcarbazole, polyvinyl pyrene, and polyvinyl anthracene, can be used.

[0057]In forming a charge transport layer of a photo conductor, a coating solution produced by making dissolve a charge transporting material and binder resin in a suitable solvent is applied on the above-mentioned charge generating layer, and is dried. As for thickness of a charge transport layer, about 10-50 micrometers is preferably desirable 5-60 micrometers.

[0058]Although the kind cannot generally prescribe content of a charge transporting material in a charge transport layer, it is desirable 0.02 - the amount part of duplexs, and to carry out 0.5-1.2 weight-section addition preferably to binder resin 1 weight section in general. Two or more sorts of compounds expressed with general formula (I) may be used for a charge transporting material used for a photo conductor, and can also be used for it combining other charge transporting materials.

[0059]As other charge transporting materials used, a hydrazone compound, a pyrazoline compound, A styryl compound, a triphenylmethane compound, an oxadiazole compound, A carbazole compound, a stilbene compound, enamine compounds, an oxazol compound, Hole transporting materials, such as a triphenylamine compound, a tetraphenyl benzidine compound, and an azine compound, A fluorenone compound, an anthra quinodimethane compound, a diphenoquinone compound, A stilbene quinone compound, a thiopyrandioxide compound, an oxadiazole compound, Various compounds, such as electron transport materials, such as a pel rente truck carboxylic acid compound, a full ORENIRIDEN methane compound, an anthraquinone compound, the Antron compound, and a cyanoviny compound, can be used.

[0060]As said solvent used in the case of formation of a charge transport layer, For example,

ketone, such as benzene, toluene, xylene, and chlorobenzene, Alcohol, such as methanol, ethanol, and isopropanol, ethyl acetate, Ester, such as ethylcellosolve, a carbon tetrachloride, carbon tetrabromide, chloroform, Ether, such as halogenated hydrocarbon, such as dichloromethane and tetrachloroethane, a tetrahydrofuran, and dioxane, dimethylformamide, dimethyl sulfoxide, a diethylformamide, etc. can be mentioned. These solvents may be used by an one-sort independent, or may use two or more sorts together as a mixed solvent.

[0061]When forming a photosensitive layer of a lamination type which was mentioned above, spreading of a charge transport layer and a charge generating layer can be performed using various kinds of coaters by a publicly known method. Specifically, a coating method with various dip coating method, spray coating method, spinner coating methods, braid coating methods, roller coating methods, wire bar coating methods, etc. can be used. Well-known additive agents, such as an additive agent for raising membrane formation nature or flexibility in a charge transport layer and an additive agent for controlling accumulation of rest potential, may be made to contain especially in the case of a photosensitive layer of a lamination type which was mentioned above.

[0062]As these concrete compounds, halogenation paraffin, polychlorinated biphenyl, A dimethylnaphtalene, o-terphenyl, m-terphenyl, p-terphenyl, Diethylbiphenyl, hydrogenation terphenyl, diisopropylbiphenyl, Benzylbiphenyl, diisopropylnaphthalene, a dibenzofuran, Plasticizers, such as 9,10-dihydroxyphenanthrene, chloranil, tetracyano quinodimethane, Tetracyanoethylene, trinitro fluorenone, dicyanobenzoquinone, It is usable in sensitizers, such as electronic suction nature sensitizers, such as tetrachlorophthalic anhydride, 3,5-dinitrobenzoic acid, and a cyanoviny compound, Methyl Violet, rhodamine B, cyanine dye, pyrylium salt, and thia pyrylium salt.

[0063]An adhesive property between a charge transport layer and a charge generating layer is improved, and when a photosensitive layer is constituted by lamination with a charge transport layer and a charge generating layer since internal stress of the layer is reduced so that there are many additions of a plasticizer, in the case of a monolayer type, an adhesive property between a photosensitive layer and a base material is improved. However, since problems, such as a fall of a mechanical strength and a fall of sensitivity, will occur if too large, it is desirable one to 100 weight section and for about 10-50 weight sections to add more preferably five to 80 weight section to charge transporting material 100 weight section. As for an addition of a sensitizer, it is desirable to charge transporting material 100 weight section 0.01 to 20 weight section and for about 0.5-8 weight sections to add more preferably 0.1 to 10 weight section.

[0064]To a photosensitive layer of a photo conductor, especially a charge transport layer, an antioxidant may be added for the purpose of ozone deterioration prevention. As an antioxidant, hindered phenol, hindered amine, a p phenylenediamine, hydroquinone, a spiro chroman,

spiroindanone, hydronaliumquinoline and these derivatives, an organophosphorus compound, an organosulfur compound, etc. are mentioned.

[0065]Although an adhesive property improves so that there are many additions of an antioxidant, if too large, problems, such as a fall of a mechanical strength and a fall of sensitivity, will occur, and if too small, sufficient effect of antioxidizing will not be acquired. Therefore, it is desirable 0.1 to 50 weight section and for about 3-20 weight sections to add more preferably one to 30 weight section to charge transporting material 100 weight section. When using an antioxidant and said plasticizer together, it is desirable one to 120 weight section and for about 10-80 weight sections of total amounts of an addition to add more preferably five to 100 weight section. Since a crystal deposit is caused or an adhesive property does not improve so much when solubility of a plasticizer or an antioxidant is low, or when the melting point is high, it is preferred that the melting point of a plasticizer or an antioxidant uses a compound 100 ** or less.

[0066]A conductive layer may be provided between a base material and an undercoat layer which constitute a photo conductor. As a conductive layer, what distributed metal objects, such as aluminum, iron, and nickel, in resin, and a thing which distributed metallic oxides, such as conductive tin oxide, titanium oxide, antimony oxide, zirconium oxide, and ITO (indium, tin oxidation thing solid solution), in resin are used suitably.

[0067]A surface protection layer may be provided on a photosensitive layer. As for thickness of a surface protection layer, 5 micrometers or less are desirable. As a material used for a surface protection layer, it is usable in what etc. distributed low resistance substances, such as remaining as it is or tin oxide, and indium oxide, for polymer, such as an acrylic resin, poly aryl resin, polycarbonate resin, urethane resin, thermosetting resin, and a photo-setting resin. An organic plasma polymerization film may be used as a surface protection layer. An organic plasma polymerization film may also contain oxygen, nitrogen, halogen, the 3rd fellows of the periodic table, and the 5th fellows atom suitably if needed.

[0068]What is necessary is just to form a charge generating material and a charge transporting material dip coating and by carrying out a spin coat using liquid which dissolved in suitable resin with binder resin, when forming a photosensitive layer of a monolayer type.

[0069]Next, a case where a compound shown by general formula (I) is used as a material of an organic electroluminescence element is explained. An embodiment of an organic electroluminescence element was typically shown in drawing 1 - drawing 4. (1) is the anode among drawing 1, and on it, an organic hole-injection transporting bed (2), an organic luminous layer (3), and the negative pole (4) have taken composition laminated one by one, and contain an amino compound expressed with the above-mentioned general formula (I) at this organic hole-injection transporting bed.

[0070]the drawing 2 **** -- (1) is the anode -- an it top -- an organic hole-injection transporting

bed (2) and an organic luminous layer (3). An electron injection transporting bed (5) and the negative pole (4) have taken composition laminated one by one, and contain an amino compound expressed with the above-mentioned general formula (I) to this organic hole-injection transporting bed or/and an organic luminous layer.

[0071]In drawing 3, (1) is the anode, and an organic luminous layer (3), an organic electron injection transporting bed (5), and the negative pole (4) have taken on it composition laminated one by one, and it contains an amino compound expressed with the above-mentioned general formula (I) to this organic luminous layer.

[0072]the drawing 4 **** -- (1) is the anode, and an organic luminous layer (3) and the negative pole (4) have taken on it composition laminated one by one, an organic luminescent material (6) and a charge transporting material (7) are included in this organic luminous layer, and it uses an amino compound expressed with the above-mentioned general formula (I) by this charge transporting material.

[0073]The anode (1) and the negative pole (4) are connected by lead (8), and, as for an organic electroluminescence element of the above-mentioned composition, an organic luminous layer (3) emits light by impressing voltage to the anode (1) and the negative pole (4). A publicly known luminescent material, a luminescence auxiliary material, and a charge transporting material that performs carrier transport can also be used for an organic luminous layer, an organic hole-injection transporting bed, and an electron injection transporting bed if necessary.

[0074]A specific amino compound expressed with general formula (I) may have small ionization potential, luminescence starting potential required [since electron hole transportation ability is large] in order to make an organic electroluminescence element emit light may be low, therefore it is stabilized and it is thought that prolonged luminescence is closed if possible. When an amino compound is used as an organic luminous body, it is thought that a function as a luminescent material of the amino compound itself and thermal stability have contributed.

[0075]A thing with a larger work function as a conductive substance used as the anode (1) of an organic electroluminescence element than 4 eV is good, Carbon, aluminum, vanadium, iron, cobalt, nickel, copper, zinc, Organic conductive resin, such as conductive metal compounds, such as tungsten, silver, gold, platinum and those alloys, tin oxide, indium oxide, antimony oxide, a zinc oxide, zirconium oxide, and also a polythiophene, and polypyrrole, is used.

[0076]What has a work function smaller than 4 eV as metal which forms the negative pole (4) is preferred, and magnesium, calcium, tin, lead, titanium, yttrium, lithium, gadolinium, an ytterbium, a ruthenium, manganese, and those alloys are used. As long as the anode and the negative pole have necessity, they may be formed of lamination more than two-layer.

[0077]In an organic electroluminescence element, it is necessary to use either one of the anode (1) or the negative pole (4) as a transparent electrode at least so that luminescence may be seen. Under the present circumstances, since transparency will be easy to be spoiled if a transparent electrode is used for the negative pole, it is preferred to use the anode as a transparent electrode. What is necessary is to mention above on a transparent substrate, and just to form so that desired translucency and conductivity may be secured using a means of distributing means, such as vacuum deposition and sputtering, a sol-gel method or resin, etc., and applying using a conductive substance [like] when forming a transparent electrode.

[0078]If have moderate intensity as a transparent substrate, an adverse effect by heat by vacuum evaporation etc. is not received, it will not be limited at the time of organic electroluminescence element production especially if transparent, but what starting is illustrated, It is also possible to use a glass substrate, transparent resin, for example, polyethylene, polypropylene, polyether sulphone, a polyether ether ketone, polyester, etc. As that by which a transparent electrode was formed on a glass substrate, although commercial items, such as ITO and NESA, are known, these may be used.

[0079]As an example of production of an organic electroluminescence element, an amino compound is explained using composition (drawing 1) at the time of using for an organic hole-injection transporting bed. First, an organic hole-injection transporting bed (2) is formed on the anode (1) mentioned above. an organic hole-injection transporting bed (2) may be formed by the applying methods [solution / a solution which may vapor-deposit an amino compound expressed with said general formula (I) carried out, and may be formed and which carried out and dissolved this amino compound, and / which dissolved with suitable resin], such as dip coating and a spin coat.

[0080]What is necessary is for the thickness to be usually about 1-500 nm, when forming with vacuum deposition, and just to form in about 5-1000 nm, when forming by the applying method. It is necessary to make high impressed electromotive force for making light emit, and luminous efficiency is bad and tends to cause degradation of an organic electroluminescence element, so that thickness to form is thick. If thickness becomes thin, although luminous efficiency becomes good, it will be broken down, and a life of an element will become short in ****.

[0081]A compound of general formula (I) can be used combining it with other charge transporting materials. Specifically A phthalocyanine compound, a naphthalocyanine compound, a porphyrin compound, Oxadiazole, triazole, imidazole, imidazoline, imidazolethione, Pyrazoline, a pyrazolone, tetrahydro imidazole, oxazol, Oxadiazole, hydrazone, acyl hydrazone, a poly aryl alkane, a stilbene, butadiene, and a benzidine type -- doria -- reel amine and a diamine type -- doria, although polymer materials, such as reel amine, etc. those derivatives and a polyvinyl carbazole, polysilane, and a conductive polymer,

etc. are mentioned, In addition, it can be used if it is the compound etc. which have the hole-injection effect outstanding to photogene, and prevented movement to an electronic injection layer or an electron transport material of an exciton generated by a luminous layer, and were excellent in thin-film-forming ability.

[0082]An organic luminous layer is formed on the above-mentioned organic hole-injection transporting bed (2). As an organic luminescent material used for an organic luminous layer, and a luminescence auxiliary material, A publicly known thing is usable and For example, EPIDO lysine, a 2,5-bis(5,7-di-t-pentyl-2-benzoxazolyl)thiophene, 2,2-(1,4-phenylene divinylene) screw benzothiazole, 2,2-(4,4-biphenylene) screw benzothiazole, 5-methyl-2-{2 - [4-(5-methyl-2-benzoxazolyl) phenyl] Vinyl} benzooxazol, a 2,5-bis(5-methyl-2-benzoxazolyl) thiophene, Anthracene, naphthalene, phenanthrene, pyrene, a chrysene, perylene, Peri non, 1,4-diphenylbutadiene, tetraphenylbutadiene, A coumarin, an acridine, a stilbene, 2-(4-biphenyl)-6-phenylbenzo oxazol, Aluminumtrisoxine, magnesium screw oxine, bis(benzo-eight quinolinol)zinc, Bis(2-methyl-8-quinolate)aluminum oxide, Indiumtrisoxine, aluminum tris (5-methyloxine), Lithium oxine, galliumtrisoxine, a calcium screw (5-chlorooxine), Polyzinc-bis(8-hydroxy-5-KINORI noryl)methane, dilithium EPINDORI dione, zinc screw oxine, and 1,2-phtalo peri non, 1,2-naphthalo peri non, a tris (8-hydroxy quinoline) aluminium complex etc. can be mentioned.

[0083]General fluorescent dye, for example, coumarin dyestuff, a perylene color, the Piran color, a thiopyran color, poly methine dye, a merocyanine color, an imidazole color, etc. can be used. As a desirable material, a chelation oxy NOIDO compound is mentioned among these especially. Monolayer composition of the photogene may be sufficient as an organic luminous layer, and in order to adjust the characteristics, such as the luminescent color and luminescence intensity, it is good also as multilayered constitution. Two or more sorts of photogene may be mixed, or it may dope to a luminous layer.

[0084]An organic luminous layer (3) may vapor-deposit and form the above photogene, and may form liquid which dissolved with a solution which dissolved this photogene, and suitable resin by the applying methods, such as dip coating and a spin coat. An amino compound expressed with general formula (I) may be used as photogene. What is necessary is just to form the thickness in about 5-1000 nm, when usually forming by about 1-500 nm and the applying method when forming with vacuum deposition. It is necessary to make high impressed electromotive force for making light emit, so that thickness to form is thick, and luminous efficiency is bad and tends to cause degradation of an organic electroluminescence element. If thickness becomes thin, although luminous efficiency becomes good, it will become easy to break it down, and a life of an element will become short. Next, the negative pole (4) is formed on an organic luminous layer (3), and it is considered as an organic electroluminescence element.

[0085]An amino compound can be used for either one of a hole-injection transporting bed or an organic luminous layer, and both when laminating a hole-injection transporting bed (2), an organic luminous layer (3), and an electron injection transporting bed (5), as shown in drawing 2. In this case, a hole-injection transporting bed can be formed in procedure same with having mentioned above, without using an amino compound, using an amino compound. It can form in procedure same with having mentioned an organic luminous layer above, and an amino compound may be used as photogene. When using an amino compound as photogene, it is preferred to mix other photogene or to dope to an organic luminous layer. An electron injection transporting bed can be formed by conventionally publicly known methods, such as vacuum deposition and the applying method, like a hole-injection transporting bed or an organic luminous layer using an electron transport material.

[0086]As an electron transport material, for example Fluorenone, anthra quinodimethane, Although there are diphenoquinone, stilbene quinone, thiopyrandioxide, oxadiazole, perylene tetracarboxylic acid, full ORENIRIDEN methane, anthraquinone, Antron, etc. and those derivatives, If it is the compound which has the capability to convey an electron, has the electron injection effect outstanding to a luminous layer or photogene, and prevented movement to a hole injection layer or a hole transporting material of an exciton generated by a luminous layer, and was excellent in thin-film-forming ability, it will not be limited to these.

[0087]As shown in drawing 3, when laminating an organic luminous layer (3) and an electron injection transporting bed (5), an organic luminous layer can be formed using an amino compound in procedure same with having mentioned above on the anode (1). An electron injection transporting bed can be formed the same with having mentioned above.

[0088]In each above-mentioned composition, a hole-injection transporting bed separates a hole-injection function and an electron hole transportation function, and is good also as two-layer composition of a hole injection layer and an electron hole transporting bed. In this case, it is preferred to use an amino compound of this invention expressed with a hole injection layer by general formula (I).

[0089]As an electron hole transporting bed, publicly known electron hole transportation material can be used. For example, N,N'-diphenyl-N,N'-bis(3-methylphenyl)-1,1'-diphenyl-4,4'-diamine, N,N'-diphenyl-N,N'-bis(4-methylphenyl)-1,1'-diphenyl-4,4'-diamine, N,N'-diphenyl-N,N'-bis(1-naphthyl)-1,1'-diphenyl-4,4'-diamine, N,N'-diphenyl-N,N'-bis(2-naphthyl)-1,1'-diphenyl-4,4'-diamine, N,N'-tetra (4-methylphenyl)-1,1'-diphenyl-4,4'-diamine, N,N'-tetra (4-methylphenyl)-1,1'-bis(3-methylphenyl)-4,4'-diamine, N,N'-diphenyl-N,N'-bis(3-methylphenyl)-1,1'-bis(3-methylphenyl)-4,4'-diamine, N,N'-bis(N-carbazolyl)-1,1'-diphenyl-4,4'-diamine, a 4,4',4''-tris(N-carbazolyl) triphenylamine, - tris (3-methylphenyl)-1,3,5-Tri (4-aminophenyl) benzene, and N,N',N''-triphenyl-N,N',N''-4, 4 and 4''-tris [N,N',N''- triphenyl- N, N', N''-tris (3-methylphenyl)] Triphenylamine and N,N'-diphenyl-N,N'-bis(4-methylphenyl)-1,1'-bis(3-

methylphenyl)-4,4'-diamine, N,N'-diphenyl-N,N'-(3-methylphenyl)-1,1'-biphenyl 4,4'-diamine etc. can be mentioned. Two or more sorts may use these, mixing.

[0090]An electron injection transporting bed also separates an electron injection function and an electron transportation function, and is good also as two-layer composition of an electronic injection layer and an electron transport layer.

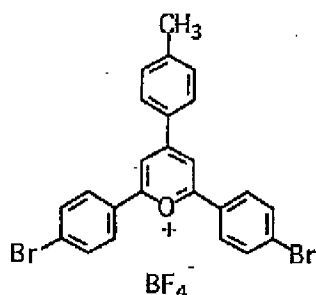
[0091]In order to form an organic luminous layer of monolayer composition as shown in drawing 4, Mixed formation of an organic luminescent material and the charge transporting material may be carried out with vapor codeposition, and it may form dip coating and by carrying out a spin coat using liquid which dissolved with a solution which dissolved an organic luminescent material and a charge transporting material, and suitable resin. An electron transport material or a hole transporting material mentioned above as a charge transporting material may be used, these may be mixed and used, and two or more sorts may be mixed and they may use material of the same transportability. What is necessary is for the thickness to be usually 5-200 nm, when forming an organic luminous layer with vacuum deposition, and just to form in about 10-500 nm, when forming by the applying method. In the case of the applying method, if photo electroconductive polymer like a polyvinyl carbazole or polyvinyl acetylene is used as resin mixed and used, the good characteristic can be obtained especially. As mentioned above, although explained taking the case of a case where each class is formed on the anode (1), each class may be formed in procedure same with having mentioned above on the negative pole (4).

[0092]An organic electroluminescence element emits light by connecting suitable leads (8), such as a Nichrome wire, a gold streak, copper wire, and a platinum wire, to the negative pole and the anode, and impressing suitable voltage (Vs) for two electrodes. An organic electroluminescence element of this invention is applicable to various kinds of displays or a display device. An example is indicated below and this invention is explained to it. the inside of an example, and a "part" -- a certain ** -- a "weight section" is expressed unless it refuses in particular.

[0093]The synthetic example 1 (composition of a compound (19))

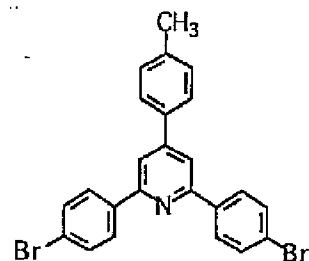
5.0 g (0.042 mol) of p-torr aldehyde and 16.6 g (0.083 mol) of 4'-bromoacetophenones are put in, 20 ml of toluene was added to this, and the 200-ml three-neck flask which formed a water-cooled condenser tube was dissolved in it. Next, the boron trifluoride-diethylether complex 17.7g (0.125 mol) is dissolved in 10 ml of toluene, and after adding stirring this solution among a room temperature, the heating rotary flow was carried out for 8 hours. Reaction mixture was cooled to a room temperature, it filtered, reduced pressure drying of the crystal which added 200 ml of 1,4-dioxane and deposited was carried out to this, and the following pyrylium salt and 13.7 g (58% of yield) were obtained as a yellow crystal.

[Formula 56]



[0094]Next, 10.0 g (0.018 mol) of the above-mentioned pyrylium salt is put in, 100 ml of tetrahydrofurans were added to this, and a 1000-ml three-neck flask was dissolved in it. After adding 300 ml of ammonia solutions 14%, it stirred at 50 °C for 1 hour. Recrystallization treatment of the crystal obtained by carrying out decompression distilling off of the solvent after extraction with dichloromethane in output was carried out with a mixed solvent of dichloromethane/hexane, and the following bromo-ized triphenylpyridine derivative and 4.5 g (54% of yield) were obtained as a reddish brown crystal.

[Formula 57]



[0095]To a 100-ml three-neck flask, then, the above-mentioned bromo-ized triphenylpyridine derivative 1.5g (0.003 mol), 1.4 g (0.069 mol) of p,p'-JITORIRU amine, 0.8 g (0.0083 mol) of sodium t-butoxide, After putting in 0.04 g (0.00017 mol) of palladium acetate, and 0.14 g (0.00067 mol) of tri-t-butylphosphine and adding 5 ml of o-xylene to this as a solvent, it stirred at 120 °C under a nitrogen atmosphere for 3 hours. After having cooled the solution to the room temperature, having added 100 ml of dichloromethane, dissolving contents and a subsequent carrying out an insoluble matter, decompression distilling off of the solvent of residue was carried out. About the obtained reaction mixture, silica gel column chromatography (developing solvent: hexane/toluene =1/1 (vol/vol)) refined, and 1.96 g (89% of yield) of object compounds (19) were obtained as a light yellow crystal.

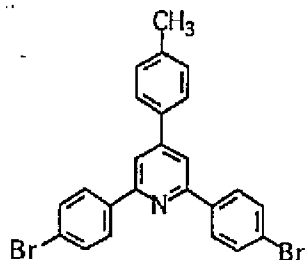
[0096]The melting point of an obtained compound was 167-169 °C. The following results were obtained when a molecular formula was analyzed. Analysis of a molecular formula was conducted using a CHN analysis apparatus. The same may be said of the following synthetic examples.

Molecular formula: C₅₂H₄₅N₃ calculated value (%) C:87.73% H:6.37% N: 5.90% Analytical

value (%) C:87.61% H:6.40% N: 5.99%[0097]synthetic example 2 (composition of a compound (76))

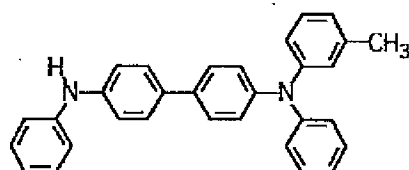
The following bromo-ized triphenylpyridine derivative obtained by the same operation as Example 1 by the 100-ml three-neck flask;

[Formula 58]



1.0 g (0.0021 mol), the following benzidine derivative;

[Formula 59]



1.8 g (0.0043 mol), 0.5 g (0.0051 mol) of sodium t-butoxide, After putting in 0.026 g (0.00012 mol) of palladium acetate, and 0.09 g (0.00046 mol) of tri-t-butylphosphine and adding 5 ml of o-xylene to this as a solvent, it agitated at 120 °C under a nitrogen atmosphere for 3 hours. After having cooled a solution to a room temperature, having added 100 ml of dichloromethane, dissolving contents and a ** exception's carrying out an insoluble matter, decompression distilling off of the solvent of residue was carried out. About an obtained reaction mixture, silica gel column chromatography (developing solvent: hexane/toluene =1/1 (vol/vol)) refined, and 2.2 g (90% of yield) of object compounds (76) were obtained as a light yellow crystal.

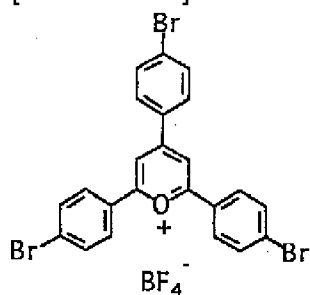
[0098]The melting point of an obtained compound was 187-189 °C. The following results were obtained when a molecular formula was analyzed.

Molecular formula: C₈₆H₆₇N₅ calculated value (%) C:88.25% H:5.77% N: 5.98% Analytical value (%) C:88.21% H:5.80% N: 5.99%[0099]synthetic example 3 (composition of a compound (38))

p-bromobenzaldehyde 15.0g (0.081 mol) and 32.3 g (0.16 mol) of 4'-bromoacetophenones are put in, 50 ml of toluene was added to this, and the 200-ml three-neck flask which formed a water-cooled condenser tube was dissolved in it. Next, the boron trifluoride-diethylether complex 34.5g (0.24 mol) is dissolved in 15 ml of toluene, and after adding stirring this solution among a room temperature, the heating rotary flow was carried out for 8 hours. Reaction

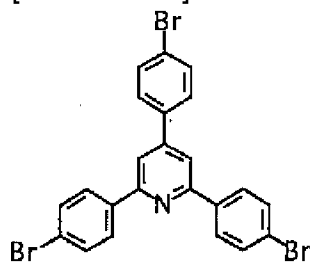
mixture was cooled to a room temperature, it filtered, reduced pressure drying of the crystal which added 400 ml of 1,4-dioxane and deposited was carried out to this, and the following pyrylium salt and 28.2 g (55% of yield) were obtained as a yellow crystal.

[Formula 60]



[0100]Next, 20.0 g (0.032 mol) of the above-mentioned pyrylium salt is put in, 150 ml of tetrahydrofurans were added to this, and a 2000-ml three-neck flask was dissolved in it. After adding 400 ml of ammonia solutions 14%, it stirred at 50 °C for 1 hour. Recrystallization treatment of the crystal obtained by carrying out decompression distilling off of the solvent after extraction with dichloromethane in output was carried out with the mixed solvent of dichloromethane/hexane, and the following bromo-ized triphenylpyridine derivative and 9.9 g (58% of yield) were obtained as a reddish brown crystal.

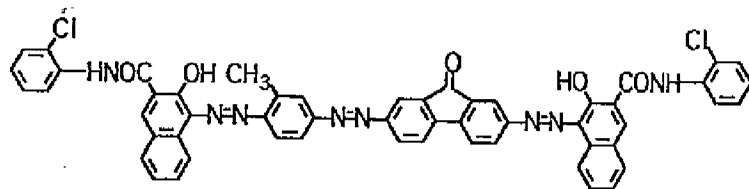
[Formula 61]



[0101]To a 100-ml three-neck flask, then, the above-mentioned bromo-ized triphenylpyridine derivative 1.8g (0.003 mol), 2.2 g (0.011 mol) of p,p'-JITORIRU amine, 1.3 g (0.013 mol) of sodium t-butoxide, After putting in 0.06 g (0.00017 mol) of palladium acetate, and 0.23 g (0.0011 mol) of tri-t-butylphosphine and adding 10 ml of o-xylene to this as a solvent, it stirred at 120 °C under a nitrogen atmosphere for 3 hours. After having cooled the solution to the room temperature, having added 100 ml of dichloromethane, dissolving contents and a subsequent carrying out an insoluble matter, decompression distilling off of the solvent of residue was carried out. About the obtained reaction mixture, silica gel column chromatography (developing solvent: hexane/toluene =1/1 (vol/vol)) refined, and 2.7 g (91% of yield) of object compounds (38) were obtained as a light yellow crystal.

[0102]The melting point of an obtained compound was 315-317 °C. The following results were obtained when a molecular formula was analyzed.

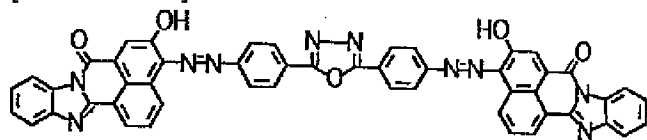
Molecular formula: $C_{65}H_{56}N_4$ calculated value (%) C:87.41% H:6.32% N: 6.27% Analytical value (%) C:87.47% H:6.28% N: 6.25%[0103]A trisazo compound expressed with the application example 1 following structural formula to a charge transporting material of an electro photography photo conductor [Formula 62]



0.45 copy and 0.45 copy of polyester resin (Byran 200; made by Toyobo Co., Ltd.) were distributed by the sand mill with 50 copies of cyclohexanones. This was dried, after applying the dispersed matter of the obtained trisazo compound to aluminum drum lifting of 80 phi by a dip coating method so that dry membrane thickness may serve as 0.3 g/m^2 . Thus, the solution which dissolved 50 copies of amino compounds (2), and 50 copies of polycarbonate resin (pan light K-1300; made in Teijin Chemicals) in 400 copies of 1,4-dioxane on the obtained charge generating layer, Applied so that dry membrane thickness might be set to 20 micrometers, and it was made to dry, and the charge transport layer was formed. Thus, the electro photography photo conductor which has a photosensitive layer which consists of two-layer was obtained. [0104]In this way, an electro photography copying machine (Minolta Co., Ltd. make; EP-540) of marketing of an obtained photo conductor is used, -Corona electrical charging was carried out at 6 kV, and extinction ratio DDR_1 (%) of initial potential when it is neglected all over a dark place for light exposure $E_{1/2}$ (lux-sec) required in order to set initial surface potential V_0 (V) and initial potential to one half, and 1 second was measured.

A photo conductor which used the amino compound (4), (5), and (8) instead of an amino compound (2) used in Example 1 with the same method as two to example 4 Example 1 and the same composition was produced. In this way, about an obtained photo conductor, V_0 , $E_{1/2}$, and DDR_1 were measured by the same method as Example 1.

[0105]A screw azo compound expressed with the example 5 following structural formula [Formula 63]

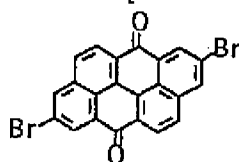


0.45 copy and 0.45 copy of polystyrene resin (molecular weight 40,000) were distributed by the sand mill with 50 copies of cyclohexanones. This was dried, after applying the dispersed matter of the obtained screw azo compound to aluminum drum lifting of 80 phi by a dip coating

method so that dry membrane thickness may serve as 0.3 g/m^2 . Thus, the solution which dissolved 50 copies of amino compounds (13) and 50 copies of polyarylate resin (U-100; made by Unitika, Ltd.) in 400 copies of 1,4-dioxane on the obtained charge generating layer was applied so that dry membrane thickness might be set to 25 micrometers, and it was dried, and the charge transport layer was formed. Thus, the electro photography photo conductor which has a photosensitive layer which consists of two-layer was obtained.

[0106]A photo conductor which used the amino compound (15), (16), and (19) instead of an amino compound (13) used in Example 5 with the same method as six to example 8 Example 5 and the same composition was produced. In this way, about an obtained photo conductor, V_0 , $E_{1/2}$, and DDR_1 were measured by the same method as Example 1.

[0107]Polycyclic quinone system paints expressed with the example 9 following structural formula [Formula 64]



0.45 copy and 0.45 copy of polycarbonate resin (pan light K-13000: made in Teijin Chemicals) are distributed by a sand mill with 50 copies of dichloroethanes, It was made to dry, after applying the dispersed matter of the obtained polycyclic quinone system paints to aluminum drum lifting of 80 phi so that dry membrane thickness may serve as 0.4 g/m^2 . Thus, applied so that the solution dry membrane thickness which dissolved 60 copies of amino compounds (25) and 50 copies of polyarylate resin (U-100: made by Unitika, Ltd.) in 400 copies of 1,4-dioxane on the obtained charge generating layer might be set to 18 micrometers, and it was made to dry, and the charge transport layer was formed. Thus, the electro photography photo conductor which has a photosensitive layer which consists of two-layer was produced.

[0108]A photo conductor which uses the amino compound (27) and (31) respectively was produced instead of an amino compound (25) used in a thing of the same composition, however Example 9 by the same method as ten to example 11 Example 9. In this way, about an obtained photo conductor, V_0 , $E_{1/2}$, and DDR_1 were measured by the same method as Example 1.

[0109]0.45 copy of example 12 titanylphthalocyanine and 0.45 copy of butyral resin (BX-1: made by Sekisui Chemical Co., Ltd.) are distributed by a sand mill with 50 copies of dichloroethanes, It was made to dry, after applying a dispersed matter of an obtained phthalocyanine pigment to aluminum drum lifting of 80 phi so that dry membrane thickness may be set to 0.3 micrometer. Thus, on an obtained charge generating layer, 50 copies of amino compounds (35) and a solution which dissolved 50 copies of polycarbonate resin (PC-Z:

made by Mitsubishi Gas Chemical Co., Inc.) in 400 copies of 1,4-dioxane were applied so that dry membrane thickness might be set to 18 micrometers, and it was dried, and a charge transport layer was formed. Thus, an electro photography photo conductor which has a photosensitive layer which consists of two-layer was produced. In this way, about an obtained photo conductor, V_0 , $E_{1/2}$, and DDR_1 were measured by the same method as Example 1.

[0110]It is made to dissolve, stirring enough 50 copies of example 13 copper phthalocyanines, and 0.2 copy of tetranitrocopper phthalocyanine to 500 copies of concentrated sulfuric acid 98%, After opening this in 5000 copies of water and depositing a photoconductivity material composition thing of a copper phthalocyanine and a tetranitrocopper phthalocyanine, it filtered and rinsed and dried at 120 °C under decompression. Ten copies of obtained photoconductivity constituents In this way, 22.5 copies of thermosetting acrylics (AKURIDEYUKU A405: made in great Japan, Inc.), 7.5 copies of melamine resin (super BEKKAMIN J820: made in great Japan, Inc.), 15 copies of amino compounds (43) are put into a ball mill pot with 100 copies of partially aromatic solvents which mixed an equivalent amount of MECHIME ethyl ketone and xylene, it distributes for 48 hours, photosensitive coating liquid is prepared, spray coating of this coating liquid is carried out to aluminum drum lifting of 80 phi, it dried and about 15-micrometer photosensitive layer was made to form. Thus, a monolayer type photo conductor was produced. In this way, about an obtained photo conductor, the same method as Example 1, however corona electrical charging were performed at +6 kV, and V_0 , $E_{1/2}$, and DDR_1 were measured.

[0111]A photo conductor which uses the amino compound (45) and (48) respectively instead of an amino compound (43) used in a thing of the same composition, however Example 13 by the same method as 14 to example 15 Example 13 was produced. In this way, about an obtained photo conductor, V_0 , $E_{1/2}$, and DDR_1 were measured by the same method as Example 13. A measurement result of V_0 of a photo conductor obtained in Examples 1-15, $E_{1/2}$, and DDR_1 is summarized in Table 1, and is shown.

[0112]

[Table 1]

	V_o (V)	$E_{1/2}$ (Lux·sec)	DDR ₁ (%)
实施例 1	-660	1.0	2.6
实施例 2	-660	1.0	2.9
实施例 3	-650	0.9	2.8
实施例 4	-660	1.0	3.0
实施例 5	-660	0.8	2.7
实施例 6	-660	0.9	3.0
实施例 7	-670	0.9	3.2
实施例 8	-650	0.7	2.9
实施例 9	-660	1.0	3.4
实施例 10	-660	0.7	2.8
实施例 11	-650	0.8	2.9
实施例 12	-660	1.0	3.3
实施例 13	+660	0.9	2.7
实施例 14	+660	0.9	3.0
实施例 15	+650	0.8	2.9

[0113]As shown in Table 1, there are photo conductors of enough of this example, a rate of a dark decay also has small electric charge maintenance ability to a grade sufficiently usable as a photo conductor, and it is excellent also in a lamination type or a monolayer type also in sensitivity. Although a repetition on-the-spot photo test at the time of right electrification by a commercial electro photography copying machine (Minolta Co., Ltd. make; EP-350Z) was done in a photo conductor of Example 13, even if it performed 1000 copies, in the first stage and a final image, story tonality is excellent, there is no sensitivity variation, and a clear picture was acquired. This shows that repetitive characteristic of a photo conductor of this invention is also stable.

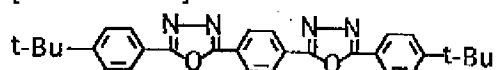
[0114]On a substrate of application example 16 indium tin oxidation thing covering glass to an organic electroluminescence element, a 50-nm-thick thin film was formed for an amino compound (15) by vacuum evaporation as an organic hole-injection transporting bed. Next, as an organic luminous layer, a thin film was formed so that it might become a thickness of 50 nm by vacuum evaporation about aluminumtrisoxine. As the negative pole, a thin film was formed so that it might become a thickness of 200 nm by vacuum evaporation about magnesium. An organic electroluminescence element was produced as mentioned above.

[0115]In 17 to example 19 Example 16, the organic electroluminescence element was produced completely like Example 16 except replacing with the amino compound (16), (19), and (26) instead of using an amino compound (15).

[0116]The thin film was formed so that it might become a thickness of 70 nm by vacuum

evaporation about an amino compound (31) as an organic hole-injection transporting bed on the substrate of example 20 indium tin oxidation thing covering glass. Next, the thin film was formed so that it might become a thickness of 100 nm about aluminumtrisoxine as an organic luminous layer. Next, the following oxadiazole compound as an organic electron injection transporting bed;

[Formula 65]

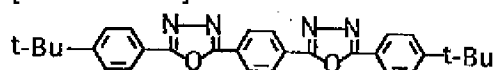


The thin film was formed so that it might become a thickness of 50 nm by vacuum evaporation. As the negative pole, the thin film was formed so that it might become a thickness of 200 nm by vacuum evaporation about magnesium. The organic electroluminescence element was produced as mentioned above.

[0117]In 21 to example 23 Example 20, the organic electroluminescence element was produced completely like Example 20 except using the amino compound (38), (44), and (50) instead of using a compound (31).

[0118]On a substrate of example 24 indium tin oxidation thing covering glass, a thin film was formed for an amino compound (55) by a thickness of 50 nm by vacuum evaporation as an organic luminous layer. Next, the following oxadiazole compound as an organic electron injection transporting bed;

[Formula 66]



The thin film was formed so that it might become a thickness of 20 nm by vacuum evaporation. The thin film was formed so that Mg and Ag might be set to 20 nm by vacuum evaporation by the atomic ratio of 10:1 as the negative pole. The organic electroluminescence element was produced as mentioned above.

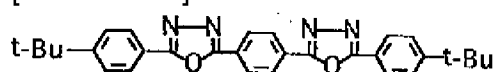
[0119]On the example 25 indium tin oxidation thing covering glass substrate, vacuum deposition of the compound (61) was carried out, and the hole injection layer of 20 nm of thickness was formed. Next, vacuum deposition of the N,N'-diphenyl-N,N'-(3-methylphenyl)-1,1'-biphenyl 4,4'-diamine was carried out, and the electron hole transporting bed of 40 nm of thickness was formed. Next, the thin film was formed so that it might become a thickness of 50 nm by vacuum evaporation about a tris (8-hydroxyquinoline) aluminium complex. The thin film was formed so that it might become a thickness of 200 nm by vacuum evaporation about Mg and Ag by the atomic ratio of 10:1 as the negative pole. The organic electroluminescence element was produced as mentioned above.

[0120]On an example 26 indium tin oxidation covering glass substrate, vacuum deposition of

the N,N'-diphenyl-N,N'-(3-methylphenyl)-1,1'-biphenyl 4,4'-diamine was carried out, and a hole-injection transporting bed of 60 nm of thickness was formed. Next, a luminous layer was formed so that it might become a thickness of 60 nm with vacuum deposition at a rate of 3:1 about a tris (8-hydroxy KIRIN) aluminium complex and an amino compound (63). A thin film was formed so that it might become a thickness of 200 nm by vacuum evaporation about Mg and Ag by an atomic ratio of 10:1 as the negative pole. An organic electroluminescence element was produced as mentioned above.

[0121] Dichloromethane was made to dissolve a compound (67) on an example 27 indium tin oxidation thing covering glass substrate, and a hole-injection transporting bed of 50 nm of thickness was obtained by spin coating. The following oxadiazole compound after forming a luminous layer so that it may become a thickness of 20 nm by vacuum evaporation about a tris (8-hydroxyquinoline) aluminium complex;

[Formula 67]



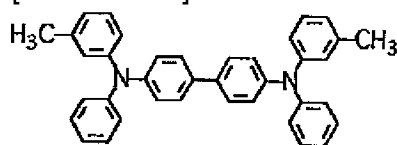
An electron injection transporting bed of 20 nm of thickness was formed by vacuum evaporation. A thin film was formed so that it might become a thickness of 200 nm by vacuum evaporation about Mg and Ag by an atomic ratio of 10:1 as the negative pole. An organic electroluminescence element was produced as mentioned above.

[0122] In 28 to example 29 Example 27, an organic electroluminescence element was produced completely like Example 27 except using the amino compound (69) and (73) instead of using a compound (67).

[0123] On an example 30 indium tin oxidation thing covering glass substrate, a compound (77), A tris (8-hydroxyquinoline) aluminium complex and polymethylmethacrylate were dissolved in a tetrahydrofuran with a wt. ratio of 3:2:5, and a luminous layer of 100 nm of thickness was formed by the spin coating method. next -- as the negative pole -- an atomic ratio of 10:1 -- Mg and Ag -- vacuum evaporation -- 200 nm -- thickness -- a thin film was formed like. An organic electroluminescence element was produced as mentioned above.

[0124] It is the following amino compound as an organic hole-injection transporting bed on a comparative example 1 indium tin oxidation thing covering glass substrate.;

[Formula 68]



The 50-nm-thick thin film was formed with vacuum deposition. Next, as an organic luminous layer, the thin film was formed so that aluminumtrioxine might be set to 50 nm in thickness

with vacuum deposition. The organic electroluminescence element was produced as mentioned above.

[0125] Luminescence starting potential when direct current voltage is applied by using the glass electrode as the anode about the organic electroluminescence element obtained by the evaluation examples 16-30 and the comparative example 1, and the highest light emitting luminance and the luminescence starting potential at that time were measured. A measurement result is summarized in Table 2 and shown.

[0126]

[Table 2]

	発光開始電圧 (V)	発光最高輝度 (cd/m ²)	最高発光輝度に おける電圧(V)
実施例16	3.5	16,000	11.7
実施例17	4.0	15,800	12.1
実施例18	3.2	16,500	12.0
実施例19	3.6	14,300	11.9
実施例20	3.4	15,700	12.2
実施例21	3.5	18,200	12.0
実施例22	3.5	15,600	12.5
実施例23	3.0	16,900	12.3
実施例24	3.5	14,600	12.0
実施例25	3.5	15,100	12.2
実施例26	3.6	18,300	12.0
実施例27	3.0	14,600	11.9
実施例28	3.2	17,800	12.0
実施例29	3.5	16,200	12.1
実施例30	3.5	15,400	12.5
比較例1	4.5	8,700	12.1

[0127] As shown in Table 2, the organic electroluminescence element of this invention showed high light emitting luminance also by the low voltage. About the organic electroluminescence element of Example 21 of this invention, when carrying out continuation luminescence by current density 1 mA/cm², stable luminescence was able to be observed for 1000 hours or more. the organic electroluminescence element of this invention is not limited to element composition materials, such as the luminescent material used for improvement in luminous efficiency and light emitting luminance, and reinforcement of an element being ***** and combining, a luminescence auxiliary material, a charge transporting material, a sensitizer, resin, and an electrode material, and an element manufacturing method.

[0128]

[Effect of the Invention] This invention provides the new amino compound which has the charge transport capability to have excelled. By using this amino compound, sensitivity, the charge transport characteristic, initial surface potential, It excels in initial electrophotographic properties, such as a rate of a dark decay, and the fatigue to repeated use can also obtain the organic electroluminescence element excellent in endurance with few electro photography photo conductors and large luminescence intensity, and low luminescence starting potential.

[Translation done.]